

PATENT SPECIFICATION

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(54) BINOCULAR DETACHABLE CAMERA ARRANGEMENT

(71) We, ASIA AMERICAN INDUSTRIES LTD. a body corporate organized under the laws of Japan of 8th Floor, Akasata Tokyu Building, 14—3 Nagatacho, 2-chome, Chiyoda-ku, Tokyo, Japan do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particular described in and by the following statement—

The present invention relates to binoculars of the type having an associated detachable camera, to enable distant objects not only to be observed but also photographed.

In a single-lens reflex camera, although it is possible to observe a distant object, three-dimensional observation is impossible. However, by associating a camera with a pair of binoculars three-dimensional observation becomes possible, since binoculars have a function of a stereo-view finder.

An object of the invention is to provide a combined binocular 1 detachable camera arrangement particularly suitable for a miniature camera e.g. a one-ten (110) 16mm film camera, so that distant objects can be observed as well as photographed.

It is a further object of the present invention to provide a binocular 1 detachable camera arrangement which can be formed by three independent components

a pair of binoculars; a miniature camera and a telephoto lens assembly, the components when assembled providing a compact and handy piece of equipment.

It a further object of the present invention to provide a binocular 1 detachable camera arrangement in which the binoculars and camera can be used separately when dismantled.

According to this invention there is provided a binocular 1 detachable camera arrangement, characterised in that space is provided along the pivoting axis between the relatively movable barrels of the

binoculars sufficient to accommodate at least a part of the length of a telephoto lens assembly for the camera, in that the eye piece lenses of the binoculars and their associated body parts are offset from said pivoting axis to provide a space sufficient to accommodate the camera body, and in that said pivoting axis defines an aperture through which the telephoto lens can extend for attachment to the camera body.

In order that the invention may be readily understood and the above and other objects and advantages of the present invention made apparent, one embodiment thereof will now be described with reference to the accompanying drawings in which:

Figure 1 is a plan view showing the embodiment of a pair of binoculars with a detachable miniature camera,

Figure 2 is a view on the line II—II of Figure 1.

Figure 3 is a sectional view illustrating the arrangement for the attachment of the miniature camera on the binoculars; the section being on the line V—V of Figure 5,

Figure 4 is an enlarged frontal view of the camera on the line III—III of Figure 3, and

Figure 5 is a frontal view of the binoculars on the line IV—IV of Figure 3.

Referring to the drawings, the pair of binoculars 1 are equipped with a detachable miniature camera 2, which camera has a telephoto lens assembly 4. The telephoto lens assembly comprises a fixed barrel part 5 attached to the camera body 2' and a removable telephoto lens barrel part 5', the two parts being intended to be supported on the binoculars so that the lens axis is co-axial with the central pivoting axis 6 of the binoculars 1. Said two barrel parts are connected by means of a mating screw and screw thread arrangement 7, 7' (see Figure 3) which are respectively formed on the front end of the fixed barrel 5 and on the rear end of the removable barrel 5'.

The pair of binoculars 1 have a body part 3 comprising a fixed lens barrel 8 and a

movable lens barrel 10 and these barrels each provide a lug part 8", 10" respectively which overlap each other and define aligned apertures whose axis constitutes said central pivoting axis 6 of said binoculars. A bush 6" with a flange 6' thereon provides an annular bearing part which is inserted into the aligned apertures and is fixed to the fixed barrel lug part 8" by means of screws 9 extending through the flange 6'.

On the other hand, the bush 6" is slidably mounted within the aperture of the moving barrel lug part 10", the end of the bush 6" being screwed to receive a threaded retaining ring 11. The fixed barrel 5 of the telephoto lens assembly 4 is of a diameter such that it can slidably fit within the bush 6" and of a length such that its screw thread part 7 projects beyond the flange 6'. The telephoto lens assembly 4 can thus be simply attached and dismantled from the binoculars by sliding the fixed barrel 5 into position in the bush 6" and then screwing the removable barrel 5' onto said fixed barrel via the screw thread arrangement 7, 7'. It will be appreciated that because of its sliding fit, the telephoto lens assembly 4 would normally be rotatable within the cylindrical bearing 6"; this would be a disadvantage because the image area, or format 12, of the miniature camera 2 should always be horizontally and vertically parallel (in register) to the image observed in the eyepiece lenses 8', 10' of the binoculars 1. To ensure accurate registry between said format 12 and the image observed by the binoculars, a guide groove 13 extends longitudinally within the bearing 6" and a mating projection 14 is formed at an appropriate radial position on the outer surface of the fixed barrel 5. Although, in this embodiment, the guide groove 13 is formed within the bearing 6" and the projection 14 is on the outer surface of the fixed barrel 5, it will be appreciated that they are reversible. A feature of the invention is that sufficient space is provided, between the fixed and movable barrels 8, 10 respectively of the body 3 of the binoculars, to accommodate the telephoto lens along said pivoting axis, and by the eyepiece lenses and their associated tubular body parts being offset from said pivoting axis 6 of the binoculars, sufficient space is provided to accommodate the camera body behind said pivoting axis (see Figures 1, 2 and 3). Particularly with reference to Figures 1 and 2, it can be seen that the camera body 2' and its telephoto lens assembly are adapted completely to the binoculars and, when combined together, the binoculars and camera provide a very compact construction.

The camera body 2' is so designed that its shutter release button 15 and film wind

knob 16 are readily available for use when attached to the binoculars.

With regard to the optical requirements, the formula for hyper-focal distance is:

hyper-focal distance

$$(b) = \frac{f^2}{ZF}$$

where

f=focal length of telephoto lens use
Z=its minimum circle of confusion, and
F=its aperture setting

if we take, as a typical example, the following conditions;

minimum circle of confusion (z)=1/60 mm
focal length (f)=60 mm, and
aperture (F)=8, then

the hyper-focal length

$$(b) = \frac{60^2}{8 \times 1/60} = 27000 \text{ mm}$$

In this case, half hyper-focal distance, b/2=13.5 m. Therefore, the depth of focus of the telephoto lens is from 13.5 m to Infinity.

The purpose of binoculars is to observe distant objects and although the nearest distance to be observed varies, depending upon the type and performance of the particular binoculars used, these objects are usually located more than 10 m from the point where the observer is standing. Therefore, by attaching a miniature camera having a telephoto lens to the binoculars in accordance with the invention, observation and photographing of distant objects becomes possible virtually without the need to adjust the focus of the telephoto lens. To eliminate completely the need to focus the telephoto lens, it can obviously be designed to have a hyper-focal distance particularly for the range of performance of the binoculars it is to be used with. Furthermore, recently developed ultrafine-grain photosensitive film enables detailed enlargements to be made. Therefore such photographing can provide very clear photographs of distant objects and a miniature camera becomes quite capable of taking accurate photographs of distant objects, thereby avoiding the need for an expensive and bulky telephoto lens assembly, and associated camera, as before.

Binoculars having a detachable miniature camera located over the tubular body parts of the eyepiece lenses 8' and 10' as mentioned above, and with the camera controls readily to hand enables the user not only to observe distant objects in three dimensions, but also to photograph the

objects precisely and timely just by pressing the shutter release button 15 on the camera body 2'.

5 In addition, the arrangement of the present invention provide a high level of productivity, since the binoculars and their associated miniature cameras can be produced and checked separately. Also, since it is simple for the user to assemble
10 and dismantle the camera and binoculars, he can use them separately or in combination as desired.

Furthermore, due to the present invention, any telephoto lens, provided that
15 its half hyper-focal distance is within the observable distance of the binoculars, is usable.

WHAT WE CLAIM IS:

20 1. A binocular 1 detachable camera arrangement, characterized in that space is provided along the pivoting axis between the relatively movable barrels of the binoculars sufficient to accommodate at
25 least a part of the length of a telephoto lens assembly for the camera, in that the eye piece lenses of the binoculars and their associated body parts are offset from said pivoting axis to provide a space sufficient to accommodate the camera body, and in that
30 said pivoting axis defines an aperture through which the telephoto lens can extend for attachment to the camera body.

35 2. A binocular 1 detachable camera arrangement according to Claim 1, characterized in that the relatively movable barrels are connected via overlapping relatively pivotal lugs which provide said

pivoting axis, the lugs having aligned apertures co-incident with the pivoting axis through which an annular bush extends, the
40 annular bush being fixed to the lug of one of said relatively movable barrels and the bore of said bush being adapted to accommodate a fixed barrel part length of said telephoto lens assembly.

3. A binocular 1 detachable camera arrangement according to Claim 2, characterized in that a guide groove is formed longitudinally within the bush and a
50 mating guide projection is formed at an appropriate radial position on the outer surface of said fixed barrel part of the telephoto lens assembly to ensure registry between the format of the camera and the
55 observed image of the binoculars.

4. A binocular 1 detachable camera arrangement according to Claim 2, characterized in that a guide groove is formed longitudinally on the outer surface
60 of said fixed barrel part of the telephoto lens assembly and a mating guide projection is formed at an appropriate radial position within the bush to ensure registry between the format of the camera and the observed
65 image of the binoculars.

5. A binocular 1 detachable camera arrangement constructed, arranged and adapted for use substantially as
70 hereinbefore described with reference to the accompanying drawings.

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COMPLETE SPECIFICATION

2 SHEETS

*This drawing is a reproduction of
the Original on a reduced scale*

Sheet 1

FIG. 1

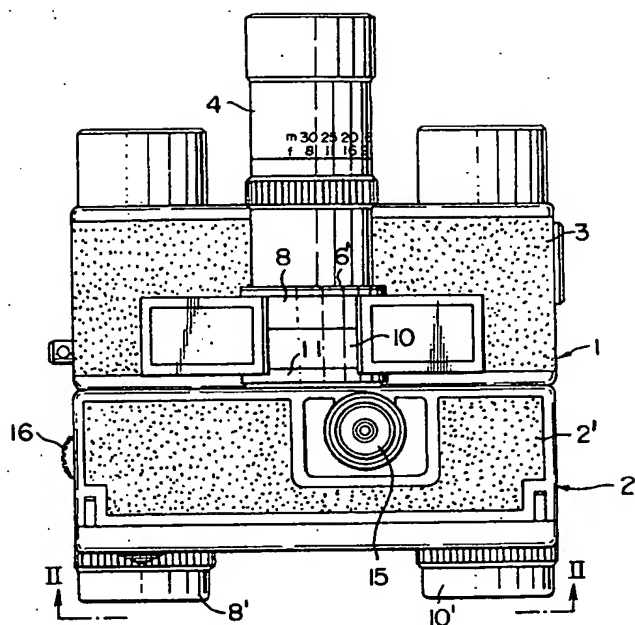
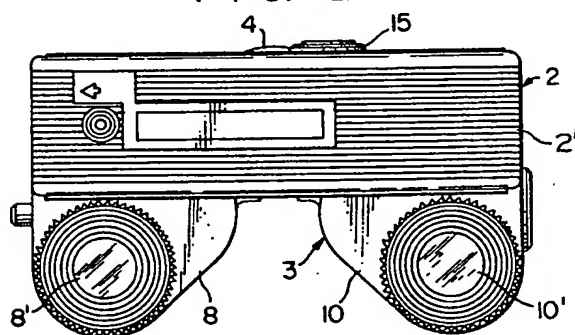


FIG. 2



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COMPLETE SPECIFICATION

2 SHEETS

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Sheet 2

FIG. 3

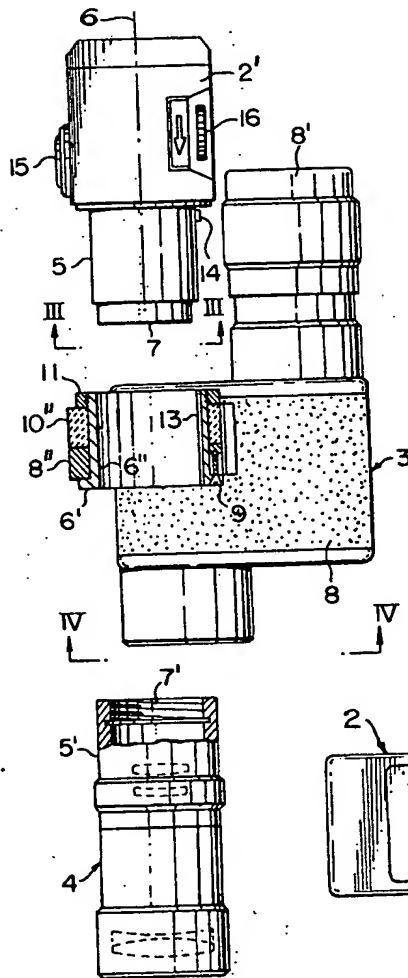


FIG. 5

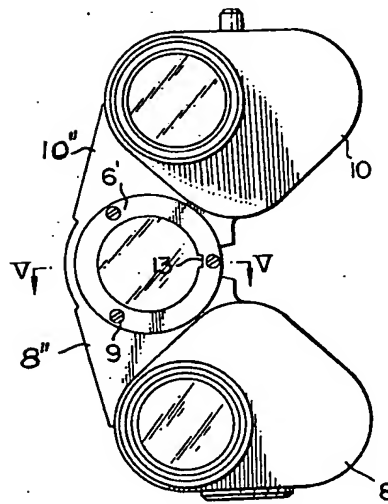


FIG. 4

